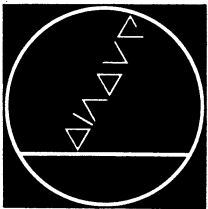


Mounting and Operating Instructions

ROD 420•00 1



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1. Standard delivery

Incremental angle encoder ROD 420.001
Mounting and operating instructions
Certificate of inspection

2. General information

- 2.1. Caution!
Do not engage or disengage any connections whilst equipment is under power.
- 2.2. Should any defect arise which cannot be rectified by the customer, we recommend the return of the encoder to our factory in Traunreut, W. Germany (address on the back page of these instructions) or to your local HEIDENHAIN supplier. Depending on the nature of damage, repairs are carried out free of charge within conditions of guarantee, or at minimal charge to the customer.
- 2.3. The encoder has been adjusted and subjected to a number of tests before leaving the factory. The accuracy has been calibrated and the encoder is therefore fully operational upon delivery.

3. Principles of operation

3.1. Encoder

ROD 420.001 is an incremental photoelectric angle encoder. A graduated glass disc is combined with the driving shaft by means of a rigid connection. The glass disc carries a radial grating which has been manufactured by the HEIDENHAIN DIADUR process. Rotation of the shaft produces electrical signals which are in close approximation of sine waves. These sine-wave signals are then entered into the pulse shaping electronics (incorporated within ROD 420.001) where they are transformed into square wave signals by Schmitt-triggers and then passed through a lead driver. The number of square-waves represents the angle of rotation. Both signal trains have a phase shift of 90° which serves in discriminating the direction of rotation. The slopes of the square-wave signals can be evaluated for 4-fold interpolation.

3.2. Reference marking

ROD 420 is supplied with a reference marking (marker pulse). An additional "index grating" is located adjacent to the radial grating of the glass disc. This grating, however, is situated only at one location and does not extend around the disc as a whole. One signal pulse is given on passing over the "marker pulse" for each revolution of the glass disc. This pulse can be utilised for the following:

- reproducing the angular position "zero"
- detection of interference pulses
- counting the number of complete revolutions of the shaft.

4. Mounting

4.1. Mounting the encoder

The encoder is provided with 2.4 mm thick $\times \varnothing 63.5 \pm 0,1$ flange enabling the unit to be mounted with adapter clamps.

4.2. Shaft connection

The shaft connection should be made with a coupling which offers sufficient transfer for the angle of rotation and prevents the effects of bending moments upon the shaft. Care must be taken that the permissible shaft loads of 10 N (axial) and 20 N (radial) are not exceeded. Refer also to Technical Specifications.

5. Electrical connection

The electrical connection is made by means of the encoder connecting cable with the following core designation.

Core colour	grey	yellow	white/brown	pink	blue	brown
Signal	Ua1	Ua2	shield	0 V	+ 5 V	Ua0

6. Technical specifications

Mechanical data

No. of pulses per revolution	635
Reference (marker) pulse	1 pulse per rev.
Max. permissible speed	12 000 r.p.m.
Starting torque at 20°C (68°F)	0.15 Ncm without shaft seal
Max. permissible angular acceleration	$1.4 \times 10^5 \text{ s}^{-2}$
Moment of inertia	14.6 gcm ²
Permissible shaft loads	axial 10 N radial 20 N
Temperature ranges	operation 0°C ... +50°C (+32°F ... +122°F) -30°C ... +80°C (-22°F ... +176°F)
Sealed protection (with exception of shaft entry)	IP 54 DIN 40050
Weight	0.33 kg
Max. shaft run-out	$\leq 0.1 \text{ mm}$
Eccentricity of shaft to centring collar	$\leq 0.2 \text{ mm}$
Counting sequence	increasing values when rotating shaft in clockwise direction as viewed on shaft stub
Shock load	30 g (11 msec.)
Vibration	10 g (10 - 2000 Hz)
Relative humidity	95 %

Electrical data

Light source

Miniature lamp 5 V/0.6 W
average life 100 000 operational
hours

Scanning elements

silicon solar cells in push-pull
arrangement

Pulse shaping electronics

incorporated within encoder
Schmitt triggers and line drivers

Supply voltage

$U_p = 5 \text{ V} \pm 5\%$

Output signals

TTL-compatible

square-wave trains

$I \leq 205 \text{ mA}$ with load $I_{\text{source}} = 4 \text{ mA}$

U_a "High" = 2.4 V with $I_{\text{source}} = 4 \text{ mA}$

U_a "Low" = 0.4 V with $I_{\text{sink}} = 4 \text{ mA}$

switching time $\leq 0.5 \mu\text{s}$

delay of U_{a0} signal to signals U_{a1}
and U_{a2} : $t \leq 1.2 \mu\text{s}$

Phase delay of electronics

$\leq 4 \mu\text{s}$

Output load capacity

$I_{\text{source}} = 6 \text{ mA}$

$I_{\text{sink}} = 20 \text{ mA}$

$C_{\text{load}} = 1000 \text{ pF}$ at cable end short

circuit protection: momentarily all
outputs against 0 V; 1 output perma-
nently short circuit proof at an
ambient temp. $\leq 25^\circ \text{C}$

Phase angle

up to 10 kHz: $90^\circ \pm 10^\circ$

up to 30 kHz: $90^\circ \pm 20^\circ$

up to 50 kHz: $90^\circ \pm 30^\circ$

ON-to-OFF ratio

"High" : "Low" = $(180^\circ + x) : (180^\circ - x)$

up to 10 kHz: $|x| = 10^\circ$

up to 30 kHz: $|x| = 20^\circ$

up to 50 kHz: $|x| = 30^\circ$

Frequency range

0 ... 50 kHz

Accuracy

$< \pm 1$ bit

Permissible cable length

15 m

Max. 50 m with differential line
receiver at the input of the subse-
quent electronics. The value of the
supply voltage must remain constant.
When using HEIDENHAIN counters
VRZ 166, 126, 136, the voltage
drop within the cable (HEIDENHAIN
extension cable BK 69.2-3-006) is
regulated over a length of 50 m.

7. Mounting dimensions (mm)

